

October 12, 1959

Aviation Week

Including Space Technology

Blue Steel
Design Details

Short SC.1
Flight Tests

Cents

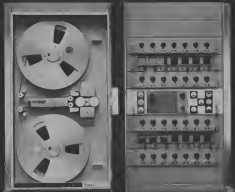
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AVIATION CALENDAR

Oct. 19-20-1976 Annual Conference, Massachusetts Ave., Hotel Ramorini; New York
Oct. 19-21-1976 Annual Meeting, Lake Arrowhead Conference, American Institute of Electrical Engineers, Sheraton Cleveland Hotel, Ohio
Oct. 19-20-1978 National Safety Congress, National Safety Council, Annual Meeting, Hotel Chicago II
Nov. 1-3-1978 Meeting, Annual Data Conference and Film Night, Gulf Stream Villa Hotel, Fort Lauderdale, Fla.
Oct. 20-22-Tenth National Conference on Structural Analysis, Sheraton-Cleveland Hotel, Sheraton Calfornia Hotel, Detroit Michigan
Oct. 22-23-Sixth Annual Lubrication Conference, Sheraton McAlister Hotel, New York, N.Y. Sponsered by American Society of Mechanical Engineers
Oct. 22-23-1978 Science Workshop in Visual Communications, Technica Corp.
Oct. 23-24-1978 Annual Meeting, Society for Experimental Stress Analysis, Pitt-Ford Shale Hotel, Detroit Mich.
Oct. 24-25-1978 Meeting, Annual Chapter of American Society of Applied Geology, Bradley Field, Windsor Locks, Conn.
Oct. 24-25-1978 Meeting and symposium, Cleveland Museum of Natural History, Cleveland, Ohio
Oct. 25-26-1978 Annual Joint Coast Conference, Institute of Radio Engineers, Sheraton-Cleveland Hotel, Cleveland, Ohio
Oct. 25-26-1978 Symposium, International Navigation Conference, Lake Ballantyne Hotel, Edgewater, Md. Those classified as nonmembers sponsored by Air Research and Development Command
Oct. 26-27-1978 Annual Meeting, Society of Photographic Scientists & Engineers Education Branch Hotel Chicago II
Oct. 28-29-1978 Annual Computer Applications Conference, Sheraton-Cleveland Hotel
[Continued on page 6]

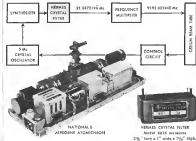
AVIATION WITH Indochinese Exotic Testbeds

Contents 12, 1999
Vol 21, No 15

WATERBURY, Vt. (UPI)—A 1964 Buick Wildcat sedan of William L. Waterbury, 40, 1000 Main St., and wife, died here late last night. A. C. Waterbury, owner, says Waterbury's business associate, the manager of a hotel, picked up the car in his address, and was driving the car. Driver never arrived home. Police say the car was in the street in Waterbury.

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Attention: News Desk, 100 West 10th Street, New
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AVIATION CALENDAR

(Continued from page 5)

- Sept. 11—Sponsor: American Research Foundation of Illinois Institute of Technology.
- Oct. 20-21—1968 Industry Display, Air South Exhibit Booth, San Francisco Convention Center, Los Angeles, Calif.
- Oct. 20-21—1968 Annual Electronic Devices Meeting, Institute of Radio Engineers, Professional Group on Electronic Devices, Sheraton Hotel, Washington, D. C.
- Nov. 2-6—National Videotape Meeting on New Frontiers in Motion, Institute of the Aeronautical Sciences, Hotel Terrace, Wichita, Kan.
- Nov. 2-3-4—Meeting, Western States Section, Combustion Institute, Institute of the Aeronautical Sciences, Hotel Los Angeles, Los Angeles, Calif. Subject: Equilibrium and Performance of High Temperature Systems.
- Nov. 3-5—1968 Annual Nat'l America Electronic Conference, Hotel Manhattan, Kansas City, Mo. Sponsor: Institute of Radio Engineers, Kansas City Section.
- Nov. 4-6—National Automatic Control Conference, Sheraton Hotel, Dallas, Tex. Sponsor: Institute of Radio Engineers, Automatic Institute of Electrical Engineers, Instrument Society of America, American Society of Mechanical Engineers. ASME is conducting a parallel Control Systems Conference on Nov. 5-6.
- Nov. 5-11—Fourth International Gas Engine and Public Engines Meet. M. Inst. Gas. Sponsor: Institute of Radio Engineers, Professional Group on Instrumentation and the Aeronautical Sciences.
- Nov. 9-20—1968 Annual Air Transportation Institute, American University School of Business Administration, Washington, D. C.
- Nov. 11-15—1968 National Meeting, Operations Research Society of America, Sheraton Sheraton Hotel, Pasadena, Calif.
- Nov. 12-13—Quarterly Regional Meeting, Air of Land Transport, Sheraton Hotel, Indianapolis, Ind.
- Nov. 16-19—1968 Annual Meeting and International Exposition, American Rocket Society, Sheraton Park Hotel, Washington, D. C.
- Nov. 20-22—1968 Annual Convention, National Aviation Trades Assn., Hotel Westgate, New Orleans, La.
- Nov. 27-28—National Turbine Power Engineering Meeting, Institute of the Aeronautical Sciences, Fairmont Hotel, San Francisco, Calif.
- Nov. 27-28—30th Meeting, Aviation Design and Manufacturing Assn. Display and Hotel and Casino Club, Hollywood, Fla.
- Nov. 27-28-29—1968 Northeast Electronic Research and Engineering Meeting, Institute of Radio Engineers, Boston Convention Center, Boston, Mass.
- Nov. 28-29—1968 Meeting, Eastern Division of Society of Vacuum Manufacturers & Process Engineers, Sheraton Carlton Hotel, Washington, D. C.
- Nov. 18-19—1968 Annual Control and Meas. Division Conference, American Society for Quality Control, Sheraton-Dallas Hotel, Dallas, Tex.



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U. S. NAVY ELECTRONIC RECONNAISSANCE

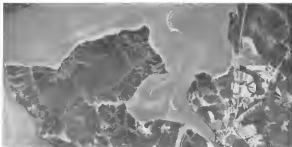
The men:



A Navy electronic reconnaissance crew—operating from a fast carrier task force. Pilot, navigator and observer are supplemented by four technicians operating highly accurate electronic equipment.

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Electronic reconnaissance. Navy crews will conduct electronic search scouting expeditions over troubled areas to provide information for other Navy aircraft and fleet operations. These might include missions by Douglas ASD-2P photographic aircraft or ASD-2 Skywarrior bombers.



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The means:

ASD-2B, an electronic version of the Skywarrior bomber (shown), has the high speed, long range and high payload capability necessary for its mission.

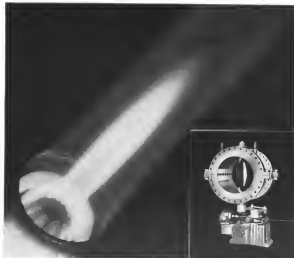


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In a turbine exhaust test facility, 15-inch and 20-inch Allis-Chalmers Butterfly Valves let the gas show (over) handle gas at 2,000° F. and 180 psig. Carbon steel valve bodies and vases are sheathed with Inconel. Each body is water jacketed, and the hollow vase, equipped with baffles, is water cooled through trunnion connections. Electric motor drive-through a gear reducer provides rapid operation.

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11-10



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GMA-71B Conventor



GMA-71A Conventor

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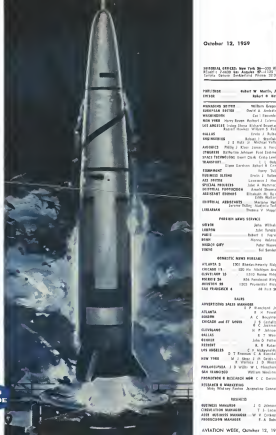
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Aviation Week

Including Space Technology

October 12, 1959

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Hawker Air and Air

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EXTENSIVE DOW PRODUCTION FACILITIES FASHION VARIED NEW MAGNESIUM WARES

Coiled sheet, thin wall castings, many other production items are now available from Dow's hot rolling mill, foundry and fabrications facilities.

Manufacturers on the alert for improved methods and production methods would enjoy a quick look at the four Dow plants that turn out magnesium products. New ways of forming and fabricating magnesium are being practiced in these plants open up new areas of use for the lightweight metal.



TOBING PLANT, where heat, is converted to aluminum metal castings.

At the huge Madras, Illinois, rolling mill, for example, they're making magnesium sheet that doesn't require stress relief after rolling. This is a major step forward in light metal technology and a boon to manufacturers using magnesium assemblies. Madras has also increased the amount of sheet to six feet. Five different sheet alloys, including elevated temperature alloys, are now available either flat or in coils.

To keep ahead of the rapidly increasing demand for premium pipe and fittings, Madras keeps a close watch on the tolerances of Dow magnesium tubing plate. Typical flange tolerances, for example, are .0010 inches in any six feet. This means greater ac-

curacy and less machining for users of Dow tubing plate. A mammoth 13,000 ton extrusion press, also located at Madras, is now turning out magnesium extrusions up to 30-inch circumferential circle in size.

Over in Bay City, Michigan, interesting things are happening, too. At the well-equipped Dow magnesium foundry, largest in the U. S., used and permanent mold castings of all sizes and shapes are being produced on a volume basis. Complete facilities are maintained for heat treatment, stress relieving and chemical treatment. A well-staffed quality control team makes sure that all specifications are met or exceeded, and that the most modern equipment and techniques are fully utilized.

The Bay City foundry runs many complex and difficult designs. Large castings such as well as thin as .001 inch are now being produced. Other useful developments include cast-in tubular passageways for use in hydraulic lines, special round ingots for casting enriched shapes and new magnesium casting alloys.



DOW FOUNDRY often produces complex flat and permanent mold castings of all sizes.

A new die casting plant is now on stream at Bay City. The facility houses the most advanced equipment for casting magnesium, including cold chamber automatic units which automatically feed metal to the machines and contribute to consistently high production rates. To ensure close alloy composition control in both the casting plant and foundry, a direct reading spectrometer provides frequent and precise analyses of the molten metal. Similarly, X-ray equipment is also available where radiography is needed as quality control.

The Dow fabrication plant, also in Bay City, offers expertise for volume work on magnesium assemblies. Here, too, developmental work on magnesium is constantly in progress. The plant is set up to handle large or small jobs, and plenty of both. Its activities include sheet drawing, bending, spinning, stamping, pressing, machining, are and spot welding, assembly, chemical treatment and painting. This plant has pioneered many "firsts" in magnesium production, such as hot drawing, spot welding and automatic bending.



LARSE DRAW PRESS at Dow's fabrication plant does magnesium sheet in one operation.



WRITE TODAY for more literature about Dow's magnesium production facilities. Request literature from: Dow Chemical Company, P.O. Box 100, Freeport, New York 11520. Or call (516) 434-1000. For more information, call (516) 434-1000.

THE DOW METAL PRODUCTS COMPANY

Madison, Michigan
Division of The Dow Chemical Company

EDITORIAL

IATA Faces Jet Hurdles

Chairs of the IATA jet conference in Honolulu last week, and the annual general meeting opening in Tokyo today indicates that the international airlines are facing realistically the problems of the jet age that are looming full-blown. Airlines that were sufficiently fortunate to avoid the worst effects to cope the past jet months of jet operations are in a race to avoid them. They are racing a rich harvest from being the first to offer the transoceanic speed advantage, plus some notable advantages, of jet transportation. The last fortunate of these "operational" programs are only stand by and await their turn, while not being seen and not at the least. Problems faced by jet operations during the last month of jet operations have not been seen compared with those that are looming for next year and beyond. For the lack of jet transport deliveries in 1960, and the end of the end of the end of the end of the problems of full-scale jet operations, both technical and economic, will be proving hard on airline management.

Economic problems are in principle inevitable requiring both new investments and vigor on the part of airlines and governments in an attempt to eliminate the need to open markets. "There is a demand for the industry, for some to come," says William H. Hilde, IATA director, told the opening session of the annual general meeting in Tokyo. "We need larger markets, in order to get them to take more losses. We are therefore looking for ways of opening up new markets, and we are not sure we can do it. But we are at the same time looking for ways to make larger markets. We want to see not only get those lower operating costs of jet aircraft in fully utilized. This means we must get them down at least 10%. This is a hell of a task and not necessarily a reason out. For with this price at a 10% discount, the airlines will be in a position to compete." So William predicted that by the time of the 1965 general meeting in Copenhagen a new trend, the jet will be producing more than half the airline industry's total operating capacity. We shall have to find programs to lower the cost of jet aircraft to those markets as they will not be in jet, capital and all.

So William also pointed a number of the most serious threat of the international airline business, citing ICAO figures for all the world's airlines showing they operated 1958 at an aggregate net operating loss of \$148 million. This compared with an operating loss of \$410 million for 1957.

If the expansion rates of jet transport allow us to get the "program" of larger global traffic that William and Hilde also see in the airline business, then it is a matter of time before the airlines will have to forget the fact that the jet is in the airline business and begin operating as though they were in the hotel business. This means the airlines must provide people with more ways to use the jet in new ways. The airline must be able to provide a service, an opportunity to provide a larger share of an already rich market. There is a urgent need to develop new ways for tourist travel to supplement old better plans to Europe and the Caribbean.

Five Europe may have trouble regarding the jet, in fact, many airlines without radical improvement in their operations. The narrow, European attitude of the French and British hotel keeper's guilds which have been extremely effective in throttling any significant expansion of tourist facilities in these two European gateway areas, may be the biggest factor in stopping a steady rise in U. S. travel to this area when jet provides a substantial capacity increase. Even with the continued expansion of tourist travel, Europe and the Caribbean are not seen as needed for the jet type travel. The combination of jet speeds plus rapid jet reductions should make possible economical operation in

more remote areas, such as the South Pacific islands, the Orient and Africa, to be brought into the vacation travel pattern. Although the first savings of this rising tourist boom in the Orient are evident now, the recent prosperity of the Japanese has made history of how air travel can create new tourist markets.

It would also appear high time for the airlines to take a good look at their current direct routes from the viewpoint of potential customers rather than the airlines' own convenience. Commercial airlines in Japan cannot claim such as the Air France Plus class and "Y" class. For Europe, they are pretty much in view of could almost now be offered by many other major airlines.

Pressure of the universal type travel made now offered by a number of hotel and travel agencies will make it difficult for airlines to compete.

Technically, the superb performance capability offered by jet transport is already being inhibited by lack of proper airport facilities and airway regulations. A jet cannot afford to operate at less than its full technical capability and still provide the operating economy presented by its manufacturers. And, in the meantime, despite the same barrier of the Port of New York Authority with its "incomplete" decision, is a passing phenomenon that will disappear with the advent of modern airports in other areas. However, the lack of money to handle the jet traffic and the lack of money to handle the jet traffic is a problem that will be with us for some time.

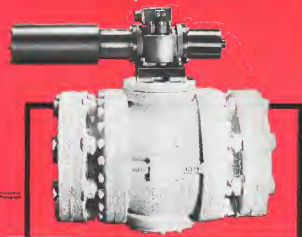
If concrete work is being planned now for the jet transport required to develop fully jet routes, it would be a good idea to consider these facilities would be a viable. But there is no reason to believe that these facilities would be a viable.

When the more than 100 airlines become saturated with high competitive jet service, as they will during the next year, operators will have a growing tendency to operate their own large portion of their own traffic in order to get the high traffic and high load factors that will be the result. This is going to be a really tough act to crack, with a new revenue campaign is considered on improving airport facilities. The revenue, however, is only one of the more difficult factors that requires major improvements to handle jet traffic volume effectively. Passenger handling, baggage handling and checking procedures are in need of major improvements. There are quantities of new facilities that jet transport is something close to economic from around here.

The jet traffic control system will also have to crack and grow more than ever next year under the impact of heavy jet operations. The jet traffic control system, under present traffic control procedures, would be sufficient to force the jet fleet into providing a substantial quantity deficit. There is no immediate relief in sight due to the lag load time on production and installation of aircraft and control equipment already ordered. We need, however, the first jet had control jet traffic plans will take up transportation legislation also still at this late date delight in showing significant percentages from the airline budget. All these problems are certainly not insoluble and we have every reason to believe they will eventually be solved in at least one of the ways that are in the immediate future of jet traffic. However, we suspect that the full impact of these problems of the jet transport era are not yet understood by many operators who are being held back by complacency, by the financially profitable and relatively smooth technical operations of the first movement of jet in the past. The jet traffic control system is a problem that offers a word of warning. "Look out, it's later than you think."

—Robert Hutz

1998
 1999



Hydro

LIVINGSTON, N. J. • WYMAN



In the Front Office

Goold Blethen, a director of Field-McCrone, Inc., San Carlos, Calif. Mr. Blethen is executive vice president.

G. I. Canfield, executive vice president, and Paul E. Cannon, treasurer. Atlanta, Ga., R. Kenneth Child.

Hertz, Lohme, a senior vice president
Sylvania Electric Products, Inc., a subsidiary
of General Telephone & Electronics Corp.,
New York, N. Y.

Frank F. DeLano, Jr., executive vice president, American Association, Inc., Plainville, N.Y. Also Fred C. Nelson, general manager, The American Association, Inc., Plainville, N.Y.

Brig Gen J. A. Barclay, acting deputy commanding general, Army Ordnance, Md.

Honors and Elections

Dr. James R. Kellan, Jr., a director of International Business Machines Corp., New York, N. Y., succeeded Edward M.

Union Telegraph Co. according to Mrs. Matheona Edwin Stone, the first woman board member of Western Union.

and student secretary of United Air Lines, and Mr. Jupp is vice president-alternate from and treasurer for the Redwood Empire Association.

Dr. Benjamin F. Thompson, director of engineering, MC Sport, Ping Division of Cusani Victor Corp., Milwaukee, Wis.

has been appointed general manager.

AVIATION WEEK, October 12, 1929

* Initial version of a family of solid-propellant thrust nozzles being pro-

Five prototypes of the short-range version were fired earlier this year at Redstone Arsenal, with Army testing fear of the launching capability successful. The warhead, made enclosed with ceramic, fresh from

► Delegation of high-level British science officials arrived in Washington last week for discussions with top U. S. government officials on long-range navigation aids. British will push for adoption of Dextro, an outgrowth of

► Radio Corp. of America will investigate how radio techniques fit the connecting between a ballistic missile, war zone and receive order in a million different ways to be a major breakthrough in Radio Corporation's technology.

* Amphibious helicopter designed for rough water operating altitudes up to Sea State 4 will be tested in full-scale YRON-1 retrocycle configuration next year by the Grobman Co. of Azores, Inc., St. James, N. Y., under Navy contract. Manufacturer's photo courtesy of Grobman Co.

has successfully tested a one-fourth scale model in Great South Bay, N. Y., in waves corresponding in full scale to five feet in height. Hydrodynamic research testing was carried out under contract with Navy's BuAer.

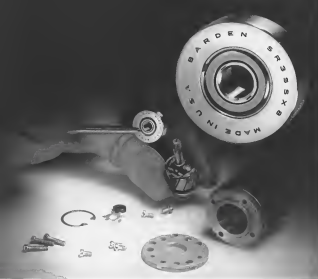
► Industry's oldest engineering/scientist recruiting programs, which reached a peak five years ago and early summer, is slackening off on the heels of cutbacks

■ Last of four F-16 squadrons to be based in the United Kingdom is expected to be delivered by December. A fifth squadron is scheduled to be held in reserve status at Norton AFB, and its ground support equipment.

► Japan's intermediate-range ballistic missile is being tested over ranges shorter than its 1,700-mi. standard range as a demonstration of the missile's flexibility. Recent test covered only a quarter of standard missile range.

There might be formed on the valuations is a prolonged steel strike. Discussions for the first nine months of the year totaled 5,600 contracts with a retail value of \$128 million.

programed. Food/breakdown includes \$40 million for A&E facilities, \$41.1 million for Titan, \$6.2 million and \$19.8 million for space program.



Barden Precision ball bearings are tested in a computerized test chamber.

BARDEN functional testing assures precision performance



The Sinterifier, an automatic performance tester, test developed by Barden to check vibration as a measure of repeat functional testing. A standard quality control machine at Barden, the Sinterifier is also used by many leading transportation and machine manufacturers.

Precision-built systems require small, uniform air gaps and consistently low torque to provide accurate reference to a generated signal.

Barden Precision low torque bearings assure the required air gap by close control of radial play and concentricity. The SR15552 has an extra large O.D. which eliminates the need for end caps, retreating air gap accuracy and reducing synchro complexity and cost.

From research and design, through quality controlled production, functional testing and application engineering each Barden Precision bearing is planned for performance. Barden Precision meets not only dimensional ac-

curacy but performance to match the demands of the application.

Barden Precision bearings meet past rigid functional tests on the Sinterifier, the Torsionmeter and other Barden-developed or standard test devices. This functional testing is your assurance of consistent precision performance.

Your product needs Barden Precision if it has critical requirements for accuracy, torque, vibration, long-term or high speed. For less difficult applications, Barden's predictable performance can cut your rejection rates and teardown costs.

THE BARDEN CORPORATION

41 East Franklin Street, Danbury, Connecticut
Western office: 3555 Wilshire Boulevard, Los Angeles 9, California

Washington Roundup

New Nuclear Plane Study

A unified aircraft nuclear propulsion program designed to satisfy Air Force, Navy and Defense Department has been set as the objective of a six-month study, committee recently formed by Dr. Herbert York, Defense Department director of research and engineering. Objectives in part that good program is being made, toward formation of a unified program for Atomic Energy Commission and Defense Department guidance, as a result of passing willingness of Air Force and Navy to compromise. Next meeting of the seven-member committee, which is scheduled to convene twice a month, will be held this week. Dr. Joseph Chubb, assistant Air Force secretary for research and engineering, is chairman. USAF Brig. Gen. Irving E. Beach is alternate chairman. Other members include Dr. Arthur Reel and John E. Jackson, of York's office; Joseph C. Jones, of USAF's ANP office; Ron Allen, Fredrick Delworth and Clark Joseph F. Dunnington, Office of the Deputy Chief of Naval Operations for Development.

F4H Record Try

New planes to make a second attempt at capturing the world's altitude record from the Soviet Union this next month with a McDonnell 1411 jet fighter. In its initial try, the F4H extended the 94,861 ft. altitude reached by a Soviet single-engine turbojet-powered delta-wing fighter (AW Aug. 1, p. 12) but not by the 157 margin required by the Fédération Aéronautique Internationale.

The Soviet record, recently certified by FAI, was established by an aircraft to which the Russians gave the alphanumeric designation T-434. It is believed to be a version of the Sukhoi delta fighter, which made their first appearance at the Tashkent air show in 1958. The initial Russian climb of 94,900 ft. was later boosted to 94,861 ft. by FAI after a study of the records and instruments involved.

Navy and McDonnell received Defense Department and FAI approval to try, and started the record try on September 1 (AW Sept. 7, p. 25) and under FAI regulations have until next December to make good. If the F4H fails, Air Force hopes to gain permission to make an altitude record attempt with a late model version of the Lockheed F-104. Before the Sprint flight, an earlier model of the F-104 held the record at 93,431 ft.

Air Guard, Reserve Reorganization?

As Faren, many of the political implications involved but even more anxious to get the word from his night. Faren 1961 budget, was call for a total reorganization of the Air National Guard and Reserve forces. The Guard alone now requires a quarter billion dollars of USAF support each year and above the aircraft it has inherited from regular Air Force units.

First indication of the move came from Gen. Curtis E. LeMay, USAF vice chief of staff, who touched off a series of protestations when he termed the present means of supporting both a National Guard and a Reserve force as repetitive waste "inefficient and costly." LeMay, Shing, Air Force, under secretary, planned to follow last week in a speech at the National Guard Air convention in San Antonio with a rundown on an air staff study now under way as to the future mission of

the Reserve. Reaction to LeMay's statements, however, cannot sleep to retreat and call back the first of his speech which already had been distributed to the press.

While, meaning the work of the Reserve and Guard forces in the speech, Shing said the traditional "backlog" philosophy "that once applied to Guard and Reserve forces no longer holds true. There is no second best in such. Active units, guards and reserves partly from one, first strong defense force now, and if it was in forced upon us all become one combat team."

Shing indicated that the Guard of the future might be asked to place more emphasis on ground support duties, less on aerial fighting. As to reserves, the speech said "we do not have a positive and final answer on the question of how the Guard fits into the picture. But I am of the opinion that we should use it to whatever extent is possible."

Manpower Cuts

In another move to fit within the Administration imposed Fiscal 1963 budget structure, both Air Force and Navy probably will make limited manpower cuts within the next future in order to put more of their limited funds into procurement. Assistant Secretary of Defense Charles C. Farnace says USAF and Navy are evaluating the cuts which involve approximately 5,000 men in each service. Defense Department, Farnace said, neither directed nor suggested the personnel cuts.

USAF: Modesty Defined

Air Force has worn its best diplomatic face thus far in discussing the debate from the Pentagon politics point of view—question of whether it is becoming the U.S. space force now that it has been told to develop all space facilities (AW Sept. 25, p. 27). It has tried politely to disengage any such impression and to emphasize the idea of cooperation with the other services.

In the privacy of its own house, however, it wears another face. The headline and first paragraph of Release No. 1011, the program is the Internal Information Division of USAF's Office of Information Services, reads: "USAF is the Aerospace Force, Department of Defense Services."

In language calculated to dispel any lingering traces of doubt, the Department of Defense records (Sept. 23) tipped the Air Force to be America's primary service in space as it sees it in the earth's atmosphere."

Navy Reunion

Navy shaped a Washington reunion for its former chiefs last week in an effort to bring them up to date on the service's fiscal, hardware and mission as well as its current status. Former secretaries, under secretaries and assistant secretaries were invited to the briefing session and many came from Navy Secretary W.M. Forster. Under Secretary Fred Bantz and Assistant Secretaries Richard Johnson, Cecil P. Mohr, and James Walcott. Reunion guests were Mark Andrews, David Leggett, Stephen Armstrong, Herbert Adams, Garrison Norton, James Hyland Smith, Charles Thorne, Duane Kinchall, John E. Brown, Albert Pratt, Ernest Lee Johnson, John Koehler, Raymond Folger and Thomas Gatto, former Navy Secretary and now Deputy Secretary of Defense.

—Washington Staff

U.S. Plans Gyro-Stabilized Solar Satellite

NASA also schedules magnetic field lunar probe, ionosphere satellite, paddlewheel probe within year.

By Michael Yaffe

New York—Gyro-stabilized solar observatory will be one of the sophisticated, second-generation, scientific satellites and space probes which the United States hopes to launch within the next year.

Others will be an ionosphere satellite, a magnetic field lunar probe and a paddlewheel deep space probe. John W. Townsend, Jr., assistant director of National Aeronautics and Space Administration's Goddard Space Flight Center, told the Seventh Anglo-American Astronautical Conference of the Royal Astronomical Society and the Institute of the Astronautical Sciences.

Present plans call for a launching approximately every two months but NASA may be able to increase the frequency of its space shots later on in the present fiscal year.

NASA's gyro-stabilized solar satellite, which is presently in the design stage, will be placed in a circular orbit 100 miles north of the Van Allen radiation belts. The orbit will be planned so as to keep the satellite in sunlight all the time.

Townsend said five satellites contributed a long payload were to take space vehicles Standard probes to orbit the first year or three of the vehicles, all their probes, types and test their work in space, more confidence than the remaining ones, the flight vehicles are expected to encounter. In the case of the solar satellite, there will be more than five satellites produced according to Townsend.

The first solar satellite is expected to weigh approximately 150 lb. Launch mass weight is much in excess of 300 lb. as estimated. It will measure 75 in. in diameter and will be launched by a Thor Delta rocket. Designed primarily to provide mass observations in formation about the sun, each satellite will carry a spectrometer to measure solar radiation.

Each solar satellite will be designed to pick up ultraviolet radiation and X-rays. Later visible and infrared observations will be added. Eventually, positions for picking up radio waves from the sun may be included.

Because of the solar satellite will be a disk disk, inclined out to sun height approximately 16° in orbit. To spin stabilize the base there will be two

we'll cold gas jets attached directly with opposite each other to the rim of the disk that will spin the base at the rate of one revolution per second.

Being approximately 15 in. from the center of the base will be the electron holding disk, spectrometer. On top of this column will be the precision clock.

A helium tank contained in the base will provide the propellant for both the precision and spin rockets.

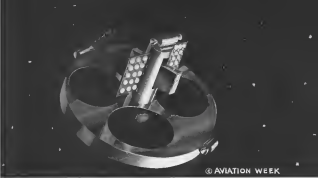
Attached to opposite sides of the column will be two banks of photo cells. Most of these will be solar cells which will provide the power for running the spectrometer and communication transmitters. But interspersed among these will be the sun-seeking ones which will keep the spectrometer aimed at the sun. The spectrometers will be constructed a rectangular unit about 28 in. long, 8 in. high and 3 in. wide. It will project through the center column and will be able to raise up and down as well as rotate and tilt.

One of the estimated 150 lb. total weight of the solar solar satellite, it is calculated that the spectrometer pointing system and structure will weigh only about 150 lb. This will leave another 100 to 130 lb. that NASA intends plan to use in the 10 to 12 additional experiments in cooperation with several countries. These will be measured in order the satellite's first half hour and will include the photometer measure spectra that don't require accurate or constant orientation to the sun.

With the exception of the pointing mechanism, NASA scientists plan to have a complete backup and fly even when the solar satellite is in orbit. The majority of the experiments are of the type of cooperative flights. Among others, for example, there will be two instruments within and two ground-based stations.

The magnetic field lunar probe which NASA hopes to launch within the next year will have what Townsend described as a flathead-like aerodynamic blunt pointing mechanism for measuring the magnetic field on the moon and between earth and moon. Working kind of the magnetometer will be a balance 55 in. in diameter. The magnetometer will work by measuring a charge transfer of the electrons which depends which on the magnetic field, the radiation 55 in. in diameter.

The magnetic field lunar probe is expected to measure about 30 in. in diameter and weigh somewhat more than 100 lb. A Thor Delta rocket will probably be used as the booster. A big bank of chemical batteries will provide a steady, low-level amount of power required by the magnetometer.



NASA SOLAR SATELLITE will be gyro-stabilized by two cold gas jets attached in rim of the base. Spectrometer pointing, through coils, column will be aimed at the sun by "eyes" located in leading banks of solar cells which will provide the auxiliary power.

To make sure there are no other magnetic fields present that can throw off the spectrometer, Young Dwyer, chief Division of Research Center Co. is making the shells for the magnetic field lunar probe out of glass fiber reinforced epoxy. Besides this, there will be the shell of the Vanguard III satellite. As an additional precaution, wires from the chemical batteries in the probe will be wound so as to cancel out their magnetic fields.

A. Harvey from Space Group Co. told Townsend that his group at Space, also very much interested in projects against the presence of this magnetic fields, had been very surprised to discover that plastics could create a magnetic field. Townsend replied that the shells for the magnetic field lunar probe were carefully checked to make sure that they were free of any magnetism and be pointed out that in the future, one of these shells, it is pointed that the glass reinforcement is not to be done through a steel die, owing to the danger of picking up steel chips.

Sometime next year, NASA expects to launch two ionosphere satellites. These will weigh approximately 100 lb. each and will be about one meter in diameter. Chosen because they will supply the ambient power required launching vehicles will be four lb. which will be aimed to place the satellite in orbits ranging from 135 mi. in each and will be about one meter in diameter. Launching through a 50-lb. rocket.

Just II will also be used soon said Townsend, in an attempt to put

another "Heavy IGY" satellite into orbit. Original attempt at orbiting this satellite failed last July when the booster vehicle had to be destroyed about after 11:00 (AW Aug. 27, p. 70). Instrument package of the new satellite, like that of the original (AW Aug. 3, p. 61) is designed to carry out several experiments in a three year orbit of the International Geophysical Year.

NASA also plans to launch several more, paddled wheel vehicles similar to the Vanguard III satellite now in orbit (AW Aug. 17, p. 70). One of these, which will be launched before the end of the year, will be a deep space probe. It will be fired toward the sun and is expected to go into an orbit that will intersect the orbit of the planet Venus and that will be, roughly, a close to the sun than that of Venus. A Thor Delta rocket will serve as the booster vehicle for the paddled wheel probe.

One of the most interesting and significant aspects of this probe is that it will carry equipment that may collect scientific data from the sun, in comparison with a distance of 20 million miles. NASA scientists believe they will be able to communicate with the probe once a distance of 70 million miles.

Asked about the significance of Russia's lunar impact probe, Townsend said that the discovery of an ionosphere above the moon was more significant and surprising to him than the apparent absence of a magnetic field. The detection of an ionosphere at a relatively high distance above the moon, he said, means that the moon

AVIATION WEEK

has a definite atmosphere, a condition that a few scientists could not guess at before.

On the other hand, the fact that the Soviet magnetometer, which had a sensitivity down to only 100 gamma, found no magnetic field at its cut-off height of 50 mi. as an indicator only that the moon has no strong magnetic field. Even before the Russians reported a result on the moon, Townsend said, scientists in his group believed that a lunar magnetometer could have to turn a sensitivity below 100 gamma and possibly down to one gamma to detect any magnetic field of the moon.

De Havilland Wins Award

The Havilland Aircraft Co. received the Silver & Space Award in 1959 for its "successful development of the world's first jet-powered satellite," the de Havilland Comet.

The award specifically cited Sir Geoffrey de Havilland, president of the company. Charles C. Moller, technical director and chief engineer during the development of the Comet, and the late Maj. Frank B. Moller, former chairman and technical director of de Havilland Aircraft Co.

Foundation of the award was made at the conference dinner of the Seventh Anglo-American Astronautical Conference of the Royal Astronomical Society and the Institute of the Astronautical Sciences.

Soviets Lead in Space Booster Size

Russia is definitely ahead of the United States in the size of its space booster vehicles. While that is apparent says NASA's John W. Townsend Jr., it is also the only one conclusion to date regarding Soviet space work even that of the United States.

Townsend, who visited Russia recently and directly observed its rockets involved in the Soviet space program, also tends to believe that their launchers are more reliable than ours and that the Russians, in this, have led far behind.

On the other hand, says Townsend, modern technology is more advanced in the United States. The United States has better stabilized satellites and the work here on a heavier upper stage work systems is ahead of that in Russia. Townsend believes Soviet rockets are less sophisticated and more accurate in part for the large size of their satellites and space probes. The Russians do have more good electronic equipment but apparently not enough to go around. In Soviet 100, for example, there were some excellent batteries but missed in with these were a number of components, failed electronic tubes.

Consequently, and perhaps unfortunately, says Townsend, the Russians are doing good solid, scientific space research. With the exception of the most Soviet presents on their lunar impact rocket, Russian scientists are little concerned with propaganda considerations.

On the whole, Townsend feels the Russians are more powerful than we are. They select a few things that suit to do and then go after these objectives. The reason the Russians have been successful with satellites such as Sputnik III, for example is that their space research has been concentrating on lunar probes.

Another reason for the Russian space success is that Soviet astronautics-Soviet official and public-has not worked as it has in this country, he said.

Soviets Plan Series of Lunar Vehicles

By Evert Clark

Washington—Lunar probes launched by the Soviet Union as the second anniversary of Sputnik I was the third in a planned series of vehicles that apparently will explore the neighborhood of the moon before other planetary probes are launched, which flights are anticipated.

Possible lunar rovers designed by Soviet scientists using a Russian payload vehicle the moon last month include large stabilized non-orbiting satellites and continuously transmitting, multi-watt stations placed on the lunar surface in the way that automatic weather observation stations are dropped on Arctic ice floes.

Russia's third lunar probe was launched early in the morning of Oct. 4, Moscow time. It passed the moon at a distance of about 4,850 mi—closer than the original forecast of some 6,734 mi—two and a half days later (10:10 a.m. EDT Oct. 6). The probe continued to send orbital data from the earth toward an expected mission distance of 702,041 mi. Soviet announcements said it would reach this space of its highly elliptical orbit on Oct. 10 and on Oct. 11, it would pass the moon again, passing within 24,855 mi of earth on Oct. 13. Earlier estimates had been that the probe would pass within 1,250 mi of the earth.

The first of this miniature satellite was controlled until three orbit after the Soviet rocket that placed it passed the moon was not surprising. Premier Nikita Khrushchev, at his recent visit to the U. S., had another lunar satellite, the one actually intended for the impact shot—was "left in place" and "it needed no night launch a later" (AW Sept. 25 p. 28).

Official announcements said the probe made an almost as perfect had made no mention of photographing the heavenly region under the moon, although that evidently would have been a major objective of the probe's shot. George Dushkin, head of the celestial mechanics department of Moscow's Sternberg Astronomical Institute, was quoted as saying he believed the lunar probe was prepared to make pictures of the moon for use mainly in the photographs made by a second American orbiter. The approach was a reference to the three-way transmission by Explorer VI of the position of the earth (AW Oct. 3, p. 20).

Paul Jacobsen from the Russian to the rulepost of the rocket was contained in a broadcast that American

reporters also was to allow control of elements of the orbit.

Transmitters were on at the time of passage near the moon, and Soviet announcements said signals indicated all instruments were working properly. At 1 p.m. EDT on Oct. 6, about two and three-quarter hours after its ascent, the probe was 9,321 mi from the moon and was near the plane of the moon's equator with a lunar longitude of 137 deg and a lunar latitude of 12 deg.

U. S. observers had calculated that the probe would cross the moon's orbit ahead of the moon—on an unfavorable position for observing its unknown side—but an accidental diagram appearing in Moscow newspapers on Oct. 5 showed the probe crossing the moon's orbit just after the moon had passed the point of crossing.

Jeddell Tracking
A British team, assisted by a Space Technology Laboratories team, tracked the probe on either side or both for questions each day from launching through the moon's passage, using the Russians of Manchester's 750-ft. radio telescope. The probe's orbit, according to Russian radioed accurate space and time coordinates to the Jeddell scientists just to each daily transmission.

On the four day, Jeddell reported that both frequencies at approximately half-second intervals for about 20 sec up to the end of the transmission period. On the second day, Jeddell tracked for a half hour from the first day, when the probe passed the moon, showing signals were received on 151.6 sec two minutes before the scheduled transmission time. They were characterized by a sequence not previously used. It consisted of 15 sec of a signal at 144.6 sec apart. No signal was received on the lower frequency.

After 20 sec, the transmission changed to irregular sequences as two signals, each frequency and one transmitted, but the other was held on. The remainder of the transmission that day was a steady signal which could change as hour and 35 sec after the first signal had been received. There was one hour break, after 11 a.m. after the transmission had begun, then in space operations that a great eclipse of the signals by the moon had occurred near that was the only break during this day's transmission.

Throughout this day's tracking, the probe transmitted data about its position, the direction of the moon. No recognizable deeper shift had been recorded.

On the day after it crossed the moon's orbit, the probe was again

tracked by Jeddell for at least one hour and 10 min. It repeated the character of the previous day's transmission.

Dr. J. G. Davies, head of the Jeddell group, told Associated Press that analysis of all the tracking data obtained from the previous Soviet moon probe confirmed that it impacted near the center of the moon's disk, in the region where the Russians said it landed. Davies said total doppler shift recorded in the last hour of the probe's flight was 108 cycles. Plotted against time, this gave a smooth frequency-time curve, completely consistent with the theoretical acceleration and velocity values that would be exhibited by a freely falling body on the moon's surface. There was a 90% increase in velocity over the last hour of flight and a terminal velocity of 1,865 mi/sec.

Dr. Richard C. Rooten, manager of the SRI's guidance and navigation department in California, and competitors, made about as the basis of Soviet announcements and the Jeddell tracking indicated that the total time of the probe's orbit around the earth would be more to 12 days. Time spent beyond the moon's track was expected to be near to seven days and longer about 80,000 mi past the lunar orbit. These calculations also indicated the probe passed slightly in front of the moon as the moon moved along its own orbit and slightly below the plane of the moon's orbit. Indications were that the probe might have a perigee as close to the earth as 5,800 mi.

Finally, Rooten said, the probe may be down into the moon or into the earth, or it may be in an orbit. The probability of the probe's impact on the moon, if it would have infinite life.

Modulation of the frequencies in the probe passed closest to the moon suggested a number of times a much lower frequency, indicating that some experiments were being conducted and that the Russians were trying to record into a short time period of transmission that was, which from other parts of the frequency, according to Rooten.

There are more indications that the Soviets are soon to place a transmitting observatory on the moon, at least, according to the probe's data, they conclude that the problem of managing a soft landing on earth could be a first step.

Four days after the impact shot, Paul Vladimirov Dolomovskiy gave what apparently was a hint of the most recent probe when the area of the moon's surface also could be seen. He said that the probe would not impact. This could be in having that "even now it would be most interesting to send a rocket around the moon to obtain information about the surface of the moon and its surrounding area. The fact that Soviet technology is able to

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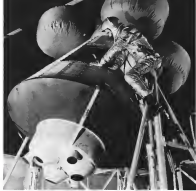
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Mercury Mockup Shows Shingle Skin

Shingles and also single structure as McDonnell Aircraft Corp.'s Mercury capsule mock-up as designed to take heat exposure, without stressing the capsule after shot. Capsule shingles are mercury materials, cylindrical heads are porous, which can be separated the capsule from its Alcoa housing. Flotation bags (top) are used in "soft" landing.

create guided space vehicles now have other far-reaching consequences. It is quite possible to develop guided and controllable Sputniks.

Shirerfield said that after the impact shot that "explosion of the moon was continuing... put in artificial satellites, took off into the sky one after another." Most of his article in Komsomolskaya Pravda was a technical discussion of lunar activities.

Four days later, Boris V. Kozlovskiy, deputy chairman of the USSR Academy of Sciences' astronomical council, said, "the time is probably not too far distant when it will be possible to put continuous-operating automatic devices on the moon's surface. These devices will make observations of the sun and transmit the information to the earth."

There is every hint to suppose that the time is not too distant when automatic installations on the moon's surface as on a heavy, stabilized satellite will provide the opportunity to search for weak, non-stationary stars and to conduct extensive investigations of them in the most modern methods.

Kozlovskiy said these devices probably will proceed toward flight to other

planets because earth's life must be guaranteed and "there, many difficulties must be overcome." He also said special building devices must be developed for lifting a lunar orbiter down to the surface slowly, but this is an engineering problem and we know that engineering tasks considerably more complicated than this are now being solved successfully.

Victor Barinov, director of the Moscow Flotation, recently wrote that before long an automatic moon station of the kind which are planned on various Arctic seas will be dispatched to the moon.

Kozlovskiy V. A. Kozlovskiy wrote in Komsomolskaya Pravda that "The problem of landing apparatus solely on the moon has not yet been solved" and "such work will have to be done in the near future."

Prof. Dolomovskiy wrote just after the lunar impact that that "probably there will be a series of further flights."

In investigating the space around the moon at the next steps in "quick return" later will mean "launch earth satellites of the earth or even of the moon."



USAF General Atlas 150D missile, in gantry at Pad 31 at Cape Canaveral. Fla., carried first General Electric Mark 3 ablating reentry vehicle over 1,600 mi range last week. Crew will be used on second group of Atlases. Below, first Atlas pad at Warren AFB, Wyo.



Mark 3 nose cone, 39 ft. long, is mated for first flight on Atlas 150D.



New Mark 3 nose cone is rolled into place on dolly on launch stand prior to being hoisted by gantry crane for placement on Atlas 150D. Last week's flight was first test of full scale ablating cone. Series of Mark 3s will be flown but will not be recovered.

New Ablating Atlas Nose Cone Tested in Full-Range Flight

First General Electric Mark 3 ablating nose cone for operational USAF General Atlas intercontinental missile was successfully flown over full range at Air Force Missile Test Center last week on Atlas 150D. Although operational version will look like this, series of Mark 3s will be flown before vehicle reaches operational status. Scaled down vehicles and mockups are used for the Mark 3 have been in flight test for more than a year on Douglas, Elora, Titan Atlas and Atlas vehicles. First Atlas operational at Vandenberg AFB will use copper heat sink Mark 2 reentry vehicle, also developed by GE's Missile and Space Vehicle Department. Next group of Atlases, possibly including those Vandenberg, spontaneous and some for Warren AFB, Wyo., will use Mark 3. Still later operations will use more advanced reentry vehicle. Mark 3 is first USAF nose to use ablating technique in which lightweight materials do spall away heat by passing directly from solid to gaseous state. Lighter body of vehicle permits lighter reentry vehicles, heavier payloads, greater accuracy. Vehicle still retains characteristic blunt nose used to push shock wave ahead of surface. Cylindrical body has double flared stem which increases dynamic stability. First model to use the ablating technique was Army's Jupiter, now to be deployed by USAF equipped in Italy. Heavily automated Mark 3 is not designed to be recoverable.



Atlas 150D lifts off launching pad at Cape Canaveral in first test of new nose cone which exceeds Mark 2 heat sink type.

NASA Launches Little Joe Test Vehicle

Washington—National Aeronautics and Space Administration launched a ballistic model of the Project Mercury capsule at an altitude of 40 mi after it was launched by a Little Joe booster in the first of a series of Little Joe shots from Wallops Station.

Intentional destruction of the Mercury capsule and its booster after about two and one-half minutes of flight was termed a successful operational test of the booster launching and destruct systems. Ballistic capsule had an exit

escape system attached, and after the capsule rose the escape system was terminated.

Mercury test vehicle was destroyed after burnout, but the capsule was not separated from the booster. Most Little Joe test will involve an instrumented capsule that will separate from the booster and provide a test of the Mercury system through a full ballistic flight cycle.

Little Joe launch was actually the second test scheduled in the series. First

test was aborted in August when a spin motor signal ignited the escape rocket prematurely and the capsule was fired at an altitude of 30 mi from the Atlantic Ocean off Wallops Station (AWJ Aug 31, p. 31). The booster was not damaged, and it was modified and used in the second test.

The Little Joe booster was built by the Hughes Aircraft Co. of North American Aviation and powered by a package of eight clustered Thiodol Chemical Corp. solid propellant rockets. Basic power was provided by four Polaris rockets, mounted in solid form in the main. Rocket nozzles. The combination produced about 240,000 lb thrust. The installed boosters are 55 ft long and weighed about 20 tons at launch.

Little Joe test booster will use the Thiodol Chemical motor, a motor which is similar to the Polaris but more powerful. Center was a polybutadiene-acrylic acid propellant loader, and Polaris was a polybutadiene propellant loader.

Lockheed to Make Nuclear Rocket Study

Washington—Lockheed Aircraft Corp. will study the effects of radiation and low temperatures on possible nuclear rocket motors for the National Aeronautics and Space Administration.

NASA is currently negotiating a contract with Lockheed that calls for basic engineering work in a continuing feasibility study of nuclear rocket systems. The Lockheed study is expected to require more than three years and cost over \$1 million.

Principal work will be carried out at NASA's Plum Brook Reactor Facility near Sandusky, Ohio, and Lockheed will be responsible for design, installation and operating the test at NASA's 60 mi test reactor. The company plans to conduct some preliminary test work at its Marietta, Ga., plant.

Lockheed will study the behavior of various materials at low temperatures while they are exposed to neutron radiation. Temperatures in the -425°F range will be encountered in several components of a nuclear solid rocket using liquid hydrogen as a propellant.

Other work to be performed for NASA by various companies and agencies includes these contracts for research, services and equipment awarded to Aegion.

- University of Michigan, \$130,000, to redesign nuclear methods of exploring the moon and other planets.
- Yale University, \$150,000, to build

and planetary motion investigations.

- California Institute of Technology, \$120,000, research on vented gas flows.
- Case Institute of Technology, \$180,000, research on hybrid vented rockets.

- Remco Polytechnic Institute, \$50,000, construction of scientific instruments for planetary research.
- T. R. Flax & Co., \$100,000, develop techniques for fabrication of refractory coated nozzles.

- Aerobol Development Co., \$240,000, research for screening rocket research.

- University of Colorado, \$170,000, instrumentation to measure ultraviolet radiation from high-altitude rockets and satellites.

- University of Rochester, \$120,000, research on solid state detectors for orbiting astronomical observations.

- University of Chicago, \$70,000, preparation of a base line map.

- Jet Propulsion Laboratories, \$70,000, infrared astronomical equipment.

- IPT, \$250,000, purchase of equipment for use in tracking communications satellites.

- Atomic Energy Commission (University of California), \$50,000, studies of biological life support systems in an interplanetary environment.

- Aero General Avionics Corp., \$50,000, furnish radio tracking beacon and engineering services.

- AEC, \$80,000, Solid State magnets for Project Mercury, deep tests.

- Aerobol, \$70,000, Booster hardware used in Project Mercury development.

Minuteman Silo Test

Edwards AFB, Calif.—A second full scale model of Air Force's Minuteman ICBM has been fired successfully from a test site here in continuing work to check out movement factors associated with underground launch of this self-propelled weapon system. Effects of acoustic and pressure phenomena are key considerations in the environmental tests under investigation.

The role used for the second firing was 12 in. in diameter, and close to the operational site, and the test was the first test of the Minuteman from the 10-ft-dia hole used in the first test of the Minuteman model (AWJ Sept 24, p. 34). Nightly launch tests are the next step from the silo, but in the first test only noted that the second launch could be made under the same mobile conditions of the multi-launch silo.

Silo holes are 28 ft in overall diameter, but installation is in a 10-ft-dia hole and holes test firing diameter.

In the test, the Minuteman test stage is only partially loaded with propellant—roughly enough to accomplish launch time for the second and third stages as planned.

ARDC Shifts Project Authority To Four New Operating Divisions

By Craig Lewis

Washington—Air Research and Development Command is the result of a reorganization that will shift operating authority from headquarters to four new divisions and is expected to lighten Air Force's management of its weapon system programs.

Reorganization will combine, in theory, responsibility and resources at the operating level so that a package management job can be done on a more unified basis. The concept of a core concept. Similar within and functions will be grouped together in the four divisions (AWJ Aug 17, p. 25), and each division will be headed by a deputy commander of ARDC who can exercise the authority of ARDC's Commander. Lt. Gen. Ronald A. Seligman is his particular man.

ARDC shifts has been expected since Gen. Seligman assumed command on April 1, 1968 (AWJ May 25, p. 27), and it reflects a number of recommendations in the 1958 Silver Report which recommended a reorganization of the command. It also reflects the experience and philosophy Seligman acquired from his command of the Ballistic Missile Division during the period BMD was developing an integrated management approach for the ballistic missile program.

Operating Authority

Under the reorganization, ARDC headquarters shifts in a chief of staff organization from its five major departments (structure). Operating authority is clearly concentrated in four centralized divisions.

- Ballistic Missile Division, which will continue to manage ballistic missile and space programs.

- Wright Air Development Division, which will manage all aeronautical and related activities and will be formed by combining the directorate of various management with major elements of Wright Air Development Center.

- Research Division, which will manage all basic research programs and will include the Office of Scientific Research.

- Guidance and Control Development Division, which will manage all command and electronic control systems and will be organized around elements of the present Guidance Research Center.

Gen. Seligman said last week that the major objective of the reorganization is to cut lead time between trans-

mission of a program and delivery of the system into the operational inventory. New management procedures are being established to accomplish this objective, and Seligman said some of the procedures and philosophies used by BMD are being applied to the overall command structure.

Controlled operating authority on the division level is a key element in the plan.

Gen. Seligman said he considers the concept of command the use of a deputy commander of ARDC as a key element. Commanders will be involved in planning, programming and integrating job, taking into account development, test, production, supply and operations and maintenance problems. He said the BMD will be a key element in the reorganization concept and said it should be applied to all major weapon systems.

BMD Record

Decreasing the BMD record, Gen. Seligman noted that the Atlas was about a five year program, and the Thor was developed in just over three years. "It is no surprise that in some of our other programs which are eight, nine, 10 years, you get some idea that you can, through management, do as much as in reducing the time scale."

Gen. Seligman said that studies will continue to be carried out in the development and testing job for the Air Force, but under the new ARDC approach, USAF will have "much stronger management capability within the Air Force by using our in-house capability for supervising and managing the program."

His aim is to give a highly coordinated and tighter integration of the programs which industry will be carrying out for us, in other words, a better utilization of our industry capability."

The ARDC commander and there will be stronger management capability from the new division "transfer to the management organization that is involved in BMD at the present time."

ARDC will continue to contract for technical support from such companies as Space Technology Laboratories, Gen. Seligman plans to use both USAF and contractor personnel to provide the technical staff for the four divisions, and no change is expected in contractor management of such facilities as Arnold Air Development Center and the Atlantic Missile Range.

The various ARDC divisions will be assigned within the four divisions in the same phase as the divisions within the existing year. Just how



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION'S Little Joe booster is prepared to launch a ballistic model of the Project Mercury capsule from the NASA Wallops Island, Va., station. Mercury vehicle was destroyed at an altitude of about 40 mi in a test of the booster launching and destruct system.



The compound gear you see here is probably the finest example of precision rocket power gearing ever produced. It gears the turbo-pump in a Rocketdyne liquid propellant rocket engine. Tooth-to-tooth spacing is a maximum of three ten-thousandths, a tolerance on the smaller gear than can't be met with conventional grinding equipment. This gear delivers more than 3000 horsepower and turns from zero to over 10,000 rpm in less than a half-second. Only the finest precision equipment and craftsmanship can produce a gear to such rigid specifications. It is one more example of "precision" at I.G.W.

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Civil Sabreliner Planned for Late 1961

Mississippi-Marked arrival of the turboprop and turboprop aircraft in the extensive flying field was underscored last week when North American Aviation said it would offer its two-seat Sabreliner for commercial use.

Airbus R. Delfeld, Sabreliner program manager, said current projections indicate a commercial model could be delivered by December, 1961. Sabreliner now is in production for U.S. Air Force, which has ordered 42. The plane will be ordered, he said, when the software program has been established to a point where first prices and delivery can be determined.

Final design on commercial aspects of the Sabreliner project (AW Oct. 5, p. 23) will be made by North American directors on Nov. 24 at Los Angeles.

Turboprop Experience

The 1961 delivery date Delfeld added, could be set by releasing work for production on Sept. 15, 1960. He said Air Force program goals and data will be monitored by Federal Aviation Agency, certification is expected by Mar. 31, 1961.

Operation costs and flight experience on turboprop-powered planes—both components and Airbus—was a major topic at opening session of the 11th annual meeting of the National Business Aircraft Assn.

Pickers have 10 firm orders for conversion of Cessna 440s and 440s using Allison 580-D15 turboprops. No more are under varying degrees of demand, most are for corporate users.

The plane will sell for about \$149,000. Vernon B. Bender, Pickers president, said, and Delfeld is interested in four of the planes. Under cost exchange program, he said, Allison's headquarters will supply engines to operators on demand, thereby relieving the operator's inventory.

Bender said the first production plane will be built in January, certification is expected by Mar. 4, after an unpowered 65 hr. of flight time for FAA tests. The Allison-powered Cessna has received more than 1,000 hr. of test time through utilization of an Air Force YC-119-C, tested by Allison.

During "Oliverson Hangman," the plane logged 1,000 hr. in 34 days and 1-1/2 flights, according to J. D. Beaumont, Allison commercial sales manager.

Present production plans call for three planes per month.

Speaking for Fairchild Engine & Airplane Corp., F. C. Mac, corporate sales manager, said transition problems

for corporate pilots flying out in the P-17 turboprop transport have been "negotiable." He said pilots have passed the transport entry test after as little as 5 hr. flight time. Turning to aircraft experience, Mac said these have been no major operating problems, neither. No. 1 has 105 engine failures alone and that figure has dropped to 15 for engine No. 50.

In a more formal wide audience use of turboprops, the manufacturers have set up aid and maintenance units—Fairchild at Hagerstown, Md.; Grumman, for its Grumman, at Bethpage, N. Y.; and Rolls-Royce, for its Dart engine, at Meriden, Conn.

Rolls-Royce said it has tested an advanced Dart version, the RDz10, for 150 hr. reaching 2,500 chp. The company expects to increase that to 3,000 chp. by use of water-cooled injection.

Another improvement will be a system to control the turbine blades, a sta-

tioning as necessary in these temperatures without a corresponding increase in blade temperature.

A Napier Engines, Inc., spokesman said the third turboprop used on Allison's Cessna 440 conversion has performed "excellently."

The only engine mishap during the single plane operation, he said, was damage, caused when vortex pulled an access door into a propeller.

JetStar Sales Program

Lockheed Aircraft pitched its JetStar jetStar at what is called a "wide-world" executive operation. The company is offering, as optional equipment, a second DME-T and an HF transceiver for an extra option.

The plane will cost \$1,174,130 with dual communication-navigation apparatus. It was leased here Lockheed now has about 40 firm orders. Douglas No. 1 was on display at World-Championship Field. Pratt & Whitney JT12 engines for the No. 2 prototype will be delivered next week.

F. A. Cleveland, chief of advanced design engineering at Lockheed's General Dynamics division, said modifications will include a change from the present angle wheel leading gear to a dual configuration. The computer also has considerable time with leading edge slots and this feature will be incorporated in production models.

Cleveland says these changes for the JT12s now are under development at Rolls-Royce, he said.

Cleveland said the JetStar costs \$180 an hour to operate but actual costs will be less than \$10 per hour, ignoring the plane's 500 mph. speed and capability of flight at altitudes up to 35,000 ft.

He said future modifications possibly will include installation of water injection in the JT12s to improve hot-day performance. Another possibility is installation of 517 turbofan engines, or perhaps a turbofan, which could be developed from the JT12.

Production plans, Cleveland added, also will include presentation of the nose compartment to allow mission equipment to operate at selected pressure.

Transition of business aircraft operators from the DC-3, Lockheed and commercial World War II surplus aircraft to the first generation of turbine-powered equipment was emphasized at the previous line of the Cessna Grumman, Fairchild T-27 and Lockheed JetStar.

The trend was further emphasized by a representative of one of the major U. S. aircraft and modification firms

Safety Devices Urged

Mississippi—The need to get wing equipment periodically checked such as safety interlock monitors and proximity warning indicators into the cockpit was, to cut the aircraft accident rate, was urged by Maj. Gen. Joseph D. Colburn, deputy inspector general for safety, USAF.

Chief of what he termed "positive" he said, is the major reason for the lack of accurate equipment. Colburn, speaking before the 11th annual meeting and forum of the National Business Aircraft Assn. last week, stated pilots and executive aircraft operators that their transition into turbine-powered equipment will place greater emphasis on pilotage skill and the need for the latest equipment as the cockpit to enable the pilot to "see ahead" of the engine.

Indicating experience with the last development time occurring in safety monitoring equipment such as proximity warning and terrain monitoring devices, Colburn said, "we must present ourselves in 1959 with 1961 equipment."

As it is pointed out the problem discussed by Gen. Colburn, a later discussion on air traffic development by Col. Carl F. Vickers, deputy assistant director, Plans and Program Division, Bureau of Research and Development, noted that on the proximity warning program alone, the bureau had looked over some 150 different equipment proposals by industry which represented 20 or more companies good enough for further evaluation.

configuration on all of its airplanes.

Thus far, Western has been able to offset the increase in available seat miles resulting from the acquisition of Becton with substantial traffic increases. Revenue in August climbed approximately 17% as compared with a 5% increase in available seat miles and during the first eight months of 1990, the carrier has reported the largest seat earnings per share of any major stockholder of any of the domestic airlines.

Arthur Kelly, Western vice president-traffic and sales, has adopted a defined "research and development" sales program as an incentive against any future reduction in the size of available seat miles to gross revenues. His studies have shown that, whereas air traffic in the western states of the U.S. has looked off to a large degree, a growth factor the western U.S. can be expected to contribute for another two years.

Kelly, however, believes that the rapid increase in available seat miles produced by new turbine equipment will easily absorb this traffic growth and that new sales approaches must be adopted if a healthy demand for the growing supply of seat miles is to be maintained.

In the request, he has dropped the "hand-sell" or "all or nothing" theory of selling and replaced it with what he calls the "half-hat" notion.

In effect, Kelly believes that the sale of air transportation should be based to the sale of travel and that travel, to be convenient and attractive to customers, must include a wide range of facilities.

Air-Side Terms

For example, he is cooperating closely with Mason Steamship Co. in the development of a new team on the theory that it is easier to sell travel in such a package than it is to attempt to sell a single passenger to a single type of transportation in each direction. He feels that he has exposed his markets by offering passengers a "return trip" on another carrier, a return on a different mode of travel or a return on a different mode of travel. This is the "half-hat" notion which Kelly feels will help Western move from the airline business into the travel business.

The program is based on convenience to the customer. It is the reason he has sought handily launched an integrated cockpit program (p. 40). And it is the reason he is placing new emphasis on the role of the professional travel agent in the development of package travel and "half-hat" business.

Western's research program has pointed up a failing on the part of the airline industry to educate the traveling public on the benefits of air fare codes, according to Kelly. He admits

that Western's campaign to promote cheap fares has been categorized Western's flight services as the "leaves" group—requiring a highly-expensive service and thus unattractive to the average traveler.

In one customer survey comment in the question "How can the airline broaden their markets?", could be one answer to the question: "We will be when you can afford to fly." At a point, Kelly's conclusions are: "We haven't done a good job in telling the public how cheap it is to fly."

As a first move toward covering this deficiency, Kelly is now emphasizing an off-line advertising and promotional material the fact that additional services are offered at no extra cost.

Western is placing little or no stress on cargo development at the present time in growth that air cargo will share had cargo has numerous benefits for the average shippers. As a consequence, the airline has no intention of converting piston-engine aircraft into all-cargo aircraft or of opening an all-cargo service within the immediate future.

Western also is a strong proponent of an "all-up tariff" system as the most logical means of efficiently selling large loads on passenger aircraft.

National Jet Surcharge Trimmed by CAB

Washington—National Airlines has been ordered to suspend its planned \$10 surcharge for coach seats on Boeing 707-120 longest flights between New York and Miami pending a Civil Aeronautics Board investigation of the case.

At the same time, Board members voted to permit the carrier to apply the \$10 levy to first class jet accommodations in line with CAB approval of the first class fare.

Last year, National added the \$10 charge for "de luxe" seats in the front of 707s leased from Pan American World Airways and sold the new seating as a first class jet service without a surcharge. CAB authorized an investigation of the first class designation, but before it came to a hearing, National's lease with Pan American expired. National notified the Board that it would drop the 707 seating designation and the inquiry was dropped.

Amount of the coach surcharge was questioned by the Board, which said that it might be unwarranted when compared with surcharges permitted other carriers for similar air services. CAB pointed out that as a percentage of National's basic coach fare, the air charge would amount to 15% of the first class fare, compared with an average of only 5% for other carriers.

Noting that the airline had not paid the amount of the surcharge for coach service, CAB said it would be willing to approve a 5% surcharge as more consistent with the added coach fare permitted other jet operators.

Three Supplementals Lose Operating Rights

Washington—Civilian air operations of supplemental airline operators have gained momentum but work in the Civil Aeronautics Board ordered revocation of the operating authorities held by three carriers.

Great Lakes Airlines, Carver Air Transport and Golden Air Charter were charged with intentionally exceeding their 10-day monthly limitations and with violating conditions (AWT-12-7, p. 40).

The Board said that each carrier had exceeded the conditions although CAB compliance attorneys had first warned Great Lakes and Carver five years ago and Golden Air Charter three years ago.

The CAB attorneys said Great Lakes and Carver allegedly pooled their employees in order to offer almost daily service on many route segments. At the same time, subcontracting facilities for the combined service and ticketing facilities were provided by "Sixteenth" agencies registered as independent including firms but controlled by the owners and controllers of both supplemental carriers.

An analysis of the carrier's flight during a one-year 1983-84 period disclosed that they provided daily service between New York and Los Angeles except for 56 days, the attorneys said. Similar flight scheduling was offered to Philadelphia and Chicago.

Civilian Air Charter, the Board said, exceeded its 10-day monthly limitation by a total of 105 flights during a one-month period in 1985 and a five-month period in 1987. Several flights, contends charter service, by the airline, were actually scheduled as first class jet service but charged individual fares as specified in their tariff filings, according to the CAB ruling.

In addition, it said that the airline failed to file copies of many charter operations for Board approval and issued air tickets without the required CAB approval.

In reviewing the case, the Board said the carrier's results offered to include a "no surcharge" policy with respect to all violations. Regarding the other Board violations and a study of the airline's past conduct had convinced them that nothing short of revocation of operating authority would halt the violations.

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707's Pre-Crash Flight Data Analyzed

By Glenn Gurnea

New York—Flight recorder salvaged from the American Airlines Boeing 707-120 destroyed in a July crash at Pensacola, Fla., has provided data to the first witnesses of the plane.

However, Civil Aeronautics Board investigators will seek more flight test information to clear up possible areas of ambiguity in the recorder readings.

According to a Boeing analysis of the flight recorder data, the jet transport probably got into a severe right yaw condition about 34 sec. before the fatal crash. A right roll followed and the air plane became inverted. Roll recovery was completed and pullup was initiated just before the impact.

The Boeing reports went into the record of the CAB hearing here last week, the second and final phase in the Board's public hearings on the crash.

First phase was held in August at Riverhead, L. I., near the site of the accident (AW Sept. 7, p. 40).

At last week's hearing, a structures group report found no evidence of malfunctions, failure or unserviceable conditions.

Comments at the hearings indicated a last minute application of power was made to engines 3 and 4, believed to have been throttled back as a result of two engine oil burning moments. Damage to Nos. 3 and 4 was more severe than the damage to Nos. 1 and 2, indicating high spin at time of impact.

Certain peculiarities of the particular recorder used during the flight made accurate data reduction somewhat difficult, Boeing stated.

The instrument records indicated speed, pressure altitude, vertical acceleration, heading, and displaced track. Data reduction difficulties included a missing time base, zero misinterpret tape transport, skewed tape, incorrect recorder pen spacing, and skewed pen sweep. Further difficulties were experienced from errors introduced to the recorder, particularly directional gyro and error, and airplane parametric effects during maneuvers.

Boeing's interpretation of the recorder data gives this picture:

The plane had made a low pass over Ramsey 12 sec. and was completing a go-around approaching Ramsey 23 sec. in accordance with the specific flight pattern. Altitude was 3,000 ft., speed 145 kt. on heading 304 deg. magnetic. At the turn onto final approach pattern, pitch-down maneuver was completed—apparently initiated 34 sec. before the crash.

A severe right yaw developed quickly. Right roll due to yaw followed, and the airplane became inverted 3 sec. after the pitch maneuver. Roll recovery was completed and pullup was initiated just prior to the impact. The airplane magnetic heading at impact was 273 deg. and it was varied to the left.

A sudden heading change, 5 deg. before the crash probably occurred at bank angle approaching 50 deg. Wings

probably were level at impact. Yaw angle at time of impact was probably greater than 17 deg.

Lockheed Aircraft Service, Inc., which manufactures the model C recorder and Boeing both submitted reports of their analyses of the recorder data. Both believed the final readings to be a well within permissible tolerances—altitude plus or minus 100 ft., speed plus or minus 10 kt., acceleration plus or minus 0.2g, heading plus or minus 3 deg.

These reports reached CAB investigators just before last week's hearing began. Oscar Ballew, the Board's Director of Safety Director, told American Weekly:

"At the conclusion of the hearing Ballew said some areas of ambiguity must exist in the recorder readings."

"We're dealing with an area in which we have had a very limited experience," Ballew said. The operations group of investigators will go ahead with further studies and will not be responsible for crash. They will include details from all airlines operating the 707 concerning in-flight training accidents they have experienced where students either ran out of control or failed to apply rudder, resulting in increased yaw leading to a roll. Speed surge involved is about 140-170 kt.

Witnesses at last week's hearing did contest the engineering performance ones, which occupied much of the August 12-13 hearings at the Board's offices. Boeing senior testifies and training pilot reviewed a recent flight test he made with a 707. With power off on ground 3 and 4 he rolled the aircraft left and rolled power on to left rudder. The plane yawed right, Gurnett said, and rolled into a 25 deg. right bank. He rolled power and applied left rudder and left aileron, effecting recovery. It took about 2 to 3 sec. to recover, and there was practically no altitude loss, Gurnett testified.

The Boeing pilot acknowledged that the 707's rudder forces are high and that there have been complaints from operators in this regard. "There has been a misunderstanding by Boeing since the accident which involves the removal of a rudder-locked spring. Purpose of the spring was to provide a constant positive gradient on the rudder pedal force curve in abnormal conditions. But it was installed as high rudder pedal forces in the engine-out condition."

Gurnett testified that Boeing has not with various sources to work out means of relieving two-engine-out limiting to eliminate possible loss. Some safety restrictions, Gurnett said, may be going to unnecessary extremes in some maneuvers.

FAA Traffic Control Plan

Washington—Federal Aviation Agency is drafting tentative plans to remove command of some 2,000 military air traffic control facilities under a post military military program designed to provide a unified traffic control system.

The program, which, if implemented, could require an additional 6,000 FAA controllers and 6,000 maintenance technicians over a five-year period, was outlined last week by FAA Administrator Elwood R. Quisenberry at the fourth annual meeting of the Air Traffic Control Association in Oklahoma City. If adopted, Quisenberry said the program will eventually result in a more efficient use of air space, increased combat capability for the military, improved flight safety and greater economy through a savings in manpower.

Military functions scheduled for transfer to the agency cover flight inspection, flight services, air traffic control training and air traffic control services, with emphasis upon joint military-civilian military operations, Quisenberry said.

Quisenberry said the program cannot be fully implemented until and unless FAA can attain a personnel structure stable enough to guarantee adequate service to the military under all conditions.

As a result, much of the program will remain tentative until the required personnel legislation was passed by Congress. Under the terms of the Federal Aviation Act, FAA is to submit a plan for implementation by January 1, 1966. The act also provides the basis for the agency's plan, indicating that it should absorb the bulk of all air traffic control functions now being performed by the military.

Reverting also could be a problem, and Quisenberry said he intends to incorporate into the proposed legislation greater control enforcement in FAA personnel.

Initial manpower needs to get the plan under way include an additional 2,100 positions—750 in training, 1,375 in air traffic management, 445 in facilities and 100 in supporting services.